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(71) Applicant(s)

NEC Technologies (UK) Ltd

(Incorporated in the United Kingdom)

**Castle Farm Campus, Priorslee, TELFORD, Shrops,
TF2 9SA, United Kingdom**

(72) Inventor(s)

Mark Grayson

Christophe Max Jean Jouin

(74) Agent and/or Address for Service

Marks & Clerk

**Alpha Tower, Suffolk Street Queensway,
BIRMINGHAM, B1 1TT, United Kingdom**

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(58) Field of Search

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(54) Multi-mode mobile phone that searches for channels in one system more frequently than in other systems

(57) A multi-mode mobile radiotelephone is operable in more than one communication system, such as in both a GSM and satellite system which use different frequency bands. The mobile phone stores network preference data identifying a level of priority for each system, and scans one system for a channel more often than other systems. In one embodiment, a mobile phone is operable in a terrestrial system and a satellite system, and scans the terrestrial band every 30 seconds and the satellite band every 2 minutes when not camped on either system. When camped on a satellite network channel the mobile scans the terrestrial band every 2 minutes. When camped on a terrestrial channel the mobile scans the satellite band every 5 minutes. Power consumption is thus reduced by scanning some frequency bands less often.

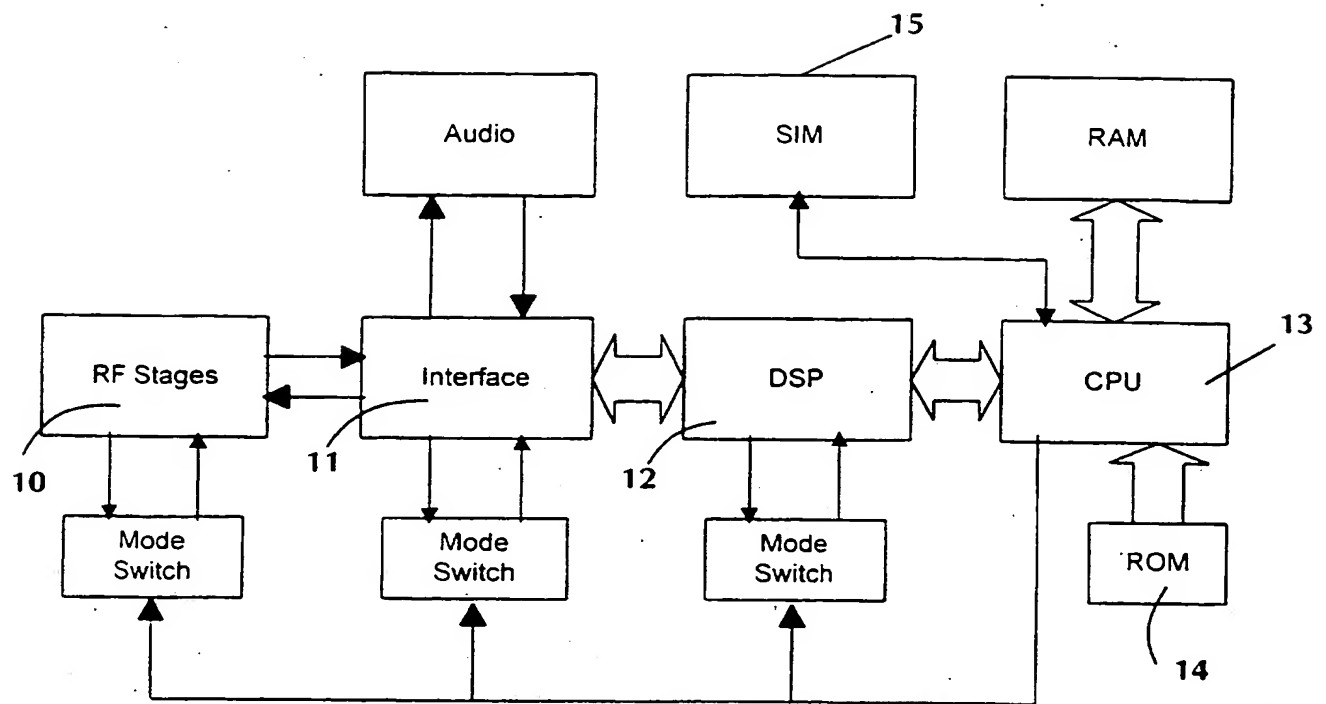


Figure 1

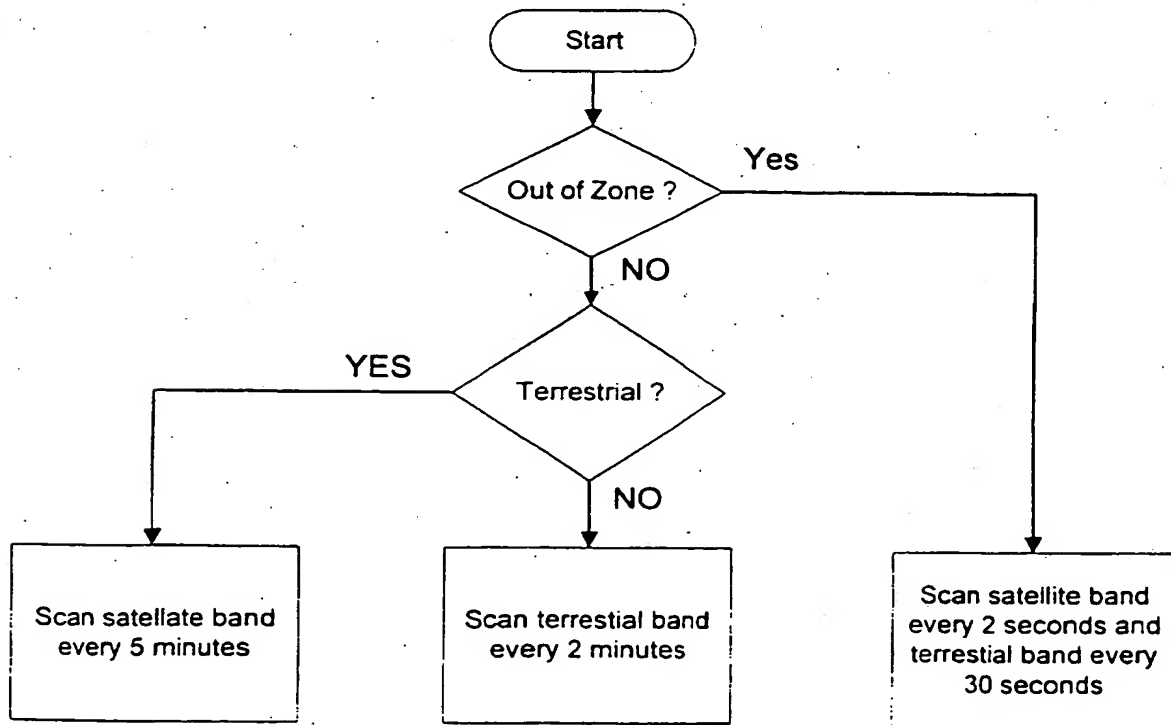


Figure 2

Multi-band mobile telecommunications station

This invention relates to a multi-band mobile telecommunications station for use in a multiple network environment, for example an environment in which there is a network of terrestrial base stations and another network of orbiting satellite stations.

The mobile station needs to be able to establish when it is in the coverage zone of any terrestrial base station or orbiting satellite station, but the operations required to enable the mobile station to search for such stations are power consuming.

It is accordingly an object of the present invention to provide a mobile telecommunications station which overcomes this problem.

A mobile telecommunications station in accordance with the invention includes a radio receiver capable of operating in a plurality of different frequency bands used by different networks, network preference data storage means for storing data which identifies a level of priority for each network, at least one of the networks being a preferred network, and a search control means determining the search frequency at which each network is searched in accordance with the preference data.

The search control means preferably varies the search strategy according to the network stations found in a previous search. For example, in a GSM/Satellite dual mode mobile station, the search control means would normally reduce the frequency of satellite searches to a minimum.

When the mobile station was not in the coverage zone of any GSM or Satellite base station, the frequency of both satellite and GSM scans

would be increased. When the mobile station was not in the coverage zone of any GSM base station, but still in the coverage zone of a satellite network, the frequency of GSM scans would not be reduced.

An example of the invention is shown in the accompanying drawings in which Figure 1 is a block diagram of a multi-band multi-mode mobile telecommunications station and Figure 2 is a flowchart of software used in the mobile station to control scanning operations.

Figure 1 shows the basic blocks of the mobile phone, namely an RF stage 10 for receiving and transmitting, an interface stage 11 which includes frequency translation components and filtering, calibration, DAC and ADC functions, a DSP 12 which implements speech coding and decoding and various frequency control and synchronisation algorithms, and a CPU 13 which exercises control over the functioning of the phone in accordance with data stored in ROM 14 and in a SIM module (personal ID card) 15.

The CPU is, in particular, responsible for the timing of scans for nearby terrestrial base stations and for satellite stations. During scanning operations, the CPU commands the DSP to scan up to three frequency values during one TDMA frame. The CPU provides the DSP with the three frequency values to check, and progressively scans through the whole terrestrial band. This cycling normally continues until there is a detected signal sufficiently strong for AGC to be established within the RF stage and then RSSI levels are received. The CPU orders the frequencies in increasing levels of RSSI. If any is above a threshold value, the CPU commands the DSP to synchronise to the channel. The DSP attempts to decode broadcast messages by first synchronising its

operation to the exact timing and frequency of the transmission and then attempts to decode a synchronisation burst. If this is successful this is registered by the CPU and the mobile station leaves out-of-zone (OOZ) operation and "camps" on the channel found.

Operations in the terrestrial and satellite bands involve different RF tuning procedures and different protocols for channel recognition and signal decoding. Thus, when searching terrestrial channels the DSP, interface and RF stages must operate in one mode and when searching for satellite channels, the same blocks must operate in a different mode. Figure 1 shows each of the blocks 10, 11, 12 with a mode control switch 10^a, 11^a and 12^a control by the CPU for switching the blocks between modes when necessary.

The CPU is programmed to give priority to terrestrial operation. Network preference data is stored in the CPU ROM (preferably EEPROM) or in the SIM as a list of networks at successive addresses in the memory. The list could contain names for the networks, such as GSM 900 MHz, GSM 1800 MHz, satellite, or tokens for the network names, the networks being listed in order of preference. In the example described herein GSM 900 MHz is the most preferred network and satellite the least preferred. Such prioritisation is illustrated in Figure 2. As shown, based on decisions as to whether the mobile station is currently in OOO operation or is camped on a satellite or terrestrial channel, the CPU instructs the DSP to search at different intervals. If the mobile station is in OOO operation, then terrestrial searches are carried out every thirty seconds and satellite searches every two minutes. If the mobile station is camped on a satellite network channel, the terrestrial band is searched

every two minutes. If the mobile station is camped on a terrestrial channel, the satellite band is searched every five minutes.

It will be clear to those skilled in this art that the principle described above can be extended to mobile stations capable of operating in three or more bands and in three or more different modes.

Claims

1. A mobile telecommunications station including a radio receiver capable of operating in a plurality of different frequency bands used by different networks, network preference data storage means for storing data which identifies a level of priority for each network, at least one of the networks being a preferred network, and a search control means determining the search frequency at which each network is searched in accordance with the preference data.
2. A mobile telecommunications station as claimed in claim 1 in which said search control means operates to vary the frequency of searching each network according to whether the mobile station is camped on a channel or not.
3. A mobile telecommunications station as claimed in claim 2 in which the search control means operates when the mobile station is not camped on a channel, to search the preferred network more frequently than the other network(s).
4. A mobile telecommunications station as claimed in claim 2 in which the search control means operates when the mobile station is camped on a channel of its preferred network to search the other network(s) less frequently than it searches its preferred network when camped on another network.



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Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.O): H4L (LDSC, LDSJ, LECC, LECTP)

Int CI (Ed.6): H04B 1/40, H04M 1/72, H04Q 7/32, 7/38

Other: Online Database: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
Y	GB2284964 A (NEC) see abstract	1 at least
Y	WO93/16548 A1 (MOTOROLA) p.19 line 27 - p.26 line 10	1 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.